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certain tendencies rapidly developing and strongly felt. We believe that they will aim at certain ends. We may present to them a universe as rationally connected (and as unreal) as a mathematical formula; we may deck it with sweet things, chocolate alphabets and magic-lantern geography, and guard the wished-for land with corporal terrors; but vainly, for, whatever our ideal of education, whatever we wish the child to know and do, the work, to be successful, must somehow be linked up with, and must become progressive stages in, the accomplishment of something towards which the child's own nature tends. This conation, this natural activity, this developmental tendency,² which many of the builders of sensational psychology reject, is for the educationist the very headstone in the corner.

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THE PROBLEM OF THE INFINITE IN SPACE AND TIME

M. RENOUVIER, one of the profoundest of modern finitists, derives his proof of the finiteness of space and time from the absurdity, and consequent unreality, of the infinite number. Certain contemporary logicians, on the other hand, prove the reality of the infinite number by appeal to the reality of empirically infinite spacial and temporal phenomena. This situation is at least interesting. As against Renouvier, it can be urged that the assertion of the finiteness of space is repugnant to the intelligence, while that of its infinity is somehow warm. But, on the other hand, there seems to be no justification for the logicians' assertion of the infinity of phenomena,¹ and Renouvier's rejection of the realized infinite number is sound. We have then the problem of reconciling the non-existential character of the infinite number with the intellectual demand that space and time be thought as infinite. A solution of this problem demands, of course, a reinvestigation of the nature of space and the formulation of a space concept.

There are three categories under which space and time can be conceived: they are *thing*, *relation*, and *quality* or *abstraction*. It is not necessary here to enter into the Leibniz-Newton controversy over relative and absolute space, as these two philosophers had different ends in view and were not talking about experience with a common purpose in mind. Also we need not touch upon the subject-object strife as waged by Fischer and Trendelenburg, for the solu-

² I do not argue that every natural tendency should be gratified; but that educational ideals must be grafted upon existing tendencies, if we are to realize them.

¹ Cf. this JOURNAL, Vol. V., No. 3, November, 1908, pp. 628-634.

tions in question, including Trendelenburg's *dritte möglichkeit*, are rooted in metaphysical presuppositions quite foreign to our empirical standpoint.² We have merely to examine the pragmatic value of the categories enumerated above with respect to the conception of space and time as finite or infinite.

The concept of space and time under the category of *things* is powerless to help us. For, as things, they must be actual and can neither be thought as finite or infinite. They can not be thought as finite, for every finite thing has limits beyond which there is something else, but to ask what is beyond space and time is absurd. And they can not be conceived as infinite things, for if actual and infinite they would present the realization of series which are defined in such a way that their realization is impossible. The category of the *thing*, therefore, even if in any sense intelligible when applied to space or time, has no value for the problem that we have undertaken to solve.

Space or time as a relation between things is still less a satisfactory concept. Not only is it hard to attach any meaning to the finity or infinity of a relation, but also it becomes necessary under this concept to speak of objects as spacially and extendedly related and not as extended and spacial. We can, of course, define the spacial as that which is spacially related to other things and is composed of spacially related parts, and analogously the temporal, and such concepts might work for geometrical analyses. We seem, however, to live with extended things that are not mere complexes of extensively related non-extended phenomena. Only a mind "debauched by learning" and so dead to reality that it lives only in a play of reason can tolerate such a concept of space or time as ultimate. Consequently, even if the mathematician, as such, is satisfied, the category of relation as applied to space and time can not satisfy the broader purpose of philosophy, which demands the equivalent of an empirical presentation.

There remains then the possibility of conceiving space and time, in some sense, as abstractions from reality. This is fundamentally the position of Berkeley, for, of course, abstraction is not here meant in the sense in which he so convincingly proved abstract ideas to be absurd. "And perhaps, if we inquire narrowly, we shall find we can not even frame an idea of pure space exclusive of all body. This I must confess seems impossible as being a most abstract idea. . . . So that when I speak of pure or empty space, it is not to be supposed that the word 'space' stands for an idea distinct from or conceivable without body and motion—though indeed we are apt to think every noun substantive stands for a distinct idea that may be separated from all others."³ If Berkeley had not been, like Spinoza, God-in-

² *Vaihinger's Commentar*, Bd. II., S. 131–151.

³ "Principles," § 116.

toxicated, he might have developed the space concept for every future empiricism. As it is, we must carry on the development of the empiricist's concept of space and time for ourselves.

In the first place, it is evident that from this point of view space and time have existence independent of the rest of reality only in relation to some perceiver for whom they are pragmatic abstractions. They are aspects of reality that may be singled out for a purpose just as a hill may be selected from a landscape although in reality it melts into it and is continuous with it. Reality presents itself to us as a changing continuity, but, because changing, not as a homogeneous continuity. Some aspects of it are of great practical moment to us and others are relatively insignificant, and this fact suggests to us the notion of discreteness. Consequently all discreteness is discreteness for some perceiver and only pragmatically real; *i. e.*, real from some point of view and for some purpose.

The fact of change is often neglected in considering the space concept, for, at first blush, space seems to be the most peaceful and abiding of entities. Locke knew that space and time could not be separated. "Expansion and duration do mutually embrace and comprehend each other; every part of space being in every part of duration, and every part of duration in every part of expansion."⁴ He might have gone farther: if one sets oneself the problem of contemplating an absolutely unchanging universe, one finds that not only time, but also space, has become meaningless. The common spacial predicates such as "distance," "direction," "between," have no significance independent of the idea of motion or change. From this dependence on the same fundamental reality and from their definite value with respect to it, space and time might be called the dimensions of change, and any change which is not both spacial and temporal is unthinkable.⁵

To conceive space and time thus as aspects of reality picked out from practical motives by the perceiver explains directly and simply the intellectual repugnance pertaining to the notion of finite space and time, for to try to conceive them as finite is to limit reality by an abstraction from it, as if one should define a necessary cataclysm and annihilation of the material universe on the grounds of a finite conception of color so that there might come to be no longer any color which things could be.

This concept also makes evident the absurdity of trying to treat space and time as actual infinities, for that would be to suppose the present actuality of all change. It is to put ourselves in the position

⁴ "Essay," II., Ch. 15, § 12.

⁵ This is affirmed of conscious, as well as of physical, change, and therefore with a readiness to accept some spatio-temporal theory of consciousness.

of a conscious absolute. But, then, there is not any space or time any more, for there is no way of abstracting them in his wholly peaceful reality. The situation may be interesting for this ideal absolute, and from his point of view, real; for mere man, however, the attitude is impractical, and the situation unreal. It is only the need of living with a changing reality that leads man to form a concept of the spacial and temporal as discrete aspects of things. A need immanent in us as living and conscious beings leads us to the abstraction of all the discrete entities out of which we build our world, and therefore this world reduces on last analysis to a pragmatic construction in the service of life, a construction in which the elements are unreal and abstract only in their discreteness, but are real and concrete in their continuity. The absolute itself is only such a construction, and as a limiting concept, having only ideal existence, may perhaps have pragmatic value. The objection to a real absolute is the same as that to a realized infinite: conceive reality as a real absolute and we are out of joint with the present and finite. It is an attempt to say what reality would be like if we were different and placed in an entirely different situation with respect to it from what we ever can be; and the difficulties of absolutism all arise from the attempt to conceive reality from such a point of view, and to derive thence conceptions which shall be of service to us in living with it as mere finite beings. We can not eat our cake and have it too.

The concept of space and time as abstractions does assure an infinity of space and time in exactly the same sense in which the mathematical infinite has meaning.⁶ There are two forms of this infinity, infinite divisibility and infinite extension. To say that space and time are infinitely divisible means that our spacial and temporal experience permits of analysis analogous to that of the number continuum. As Berkeley says:⁷ "In arithmetic, therefore, we regard not the *things*, but the *signs*, which nevertheless are not regarded for their own sake, but because they direct us how to act with relation to things, and dispose rightly of them." In other words, an elaborate definition like that of the linear continuum is merely the formulation of the method for breaking a line in two in so many ways that no conceivable break is unspecified. But to use an expression from my previous paper in this JOURNAL, referred to above, in a mathematical infinite new elements are always "bubbling up" and in calling space infinitely divisible, we are merely asserting that the evolution of our spacial experience is of the same type as the evolution of entities in the mathematical linear continuum.

With respect to infinite extension, the application is a little more

⁶ Cf. note 1.

⁷ "Treatise," § 122.

difficult to make. It is impossible to think of a growth or development of space without motion, and motion can only be defined as change of place. It is therefore evident that we do not mean by the infinity of space an extension of actual space in connection with a fuller experience of reality. When we define a mathematical series as infinite, as for example the whole number series, we mean that there is nothing in the nature of that series, as a pragmatic postulate, to limit the extent of any concrete realization of it, and that no actual or imaginable class of entities could be limited by it. Exactly the same thing is true of the infinity of space. To call space infinite means that the particular isolatable aspect of reality that we call space is of such a nature that it can not define a limit to existent reality, and that, therefore, in so far as reality exists it is spacial. The infinity of time is significant in a perfectly analogous fashion.

It follows that different geometrical conceptions of space, n -dimensional or curved, can be put on a level with the Euclidean concept, if they can be shown to be serviceable interpretations of the spacial aspect of experience. It is even possible to state the conditions under which a finite part of space might demand actual treatment as infinite from beings suitably organized. If, for example, as every object moved from some point in such a space, the object shrank to one half its size in the first unit distance, to one quarter of its original size in the next half-unit distance, etc., the distance of two units, as applied by a being not subject to the laws of that space, would comprise an infinity of space for beings within it, *i. e.*, whose experience was organized in accordance with its laws.⁸ Their experience might appear spacially to them exactly as ours does to us, and there is no reason, except the spirit manifest in Occam's razor, to prevent us from considering our experience of reality as a fragment of a larger reality, experienced by differently organized beings as a greater space, and as containing our "infinity" as a finite portion. And this, it seems to me, is a reason why occult speculation is not eradicated from philosophy. There are always minds for whom it is easier to multiply hypotheses, even at the risk of clarity and at the expense of losing the advantages of our present scientific constructions, rather than to work and wait to understand a confused residuum of experienced reality in terms of already existing scientific postulates. It is easier to be mystical than scientific, and to formulate speculatively possible, but practically unverifiable, hypotheses than to apply verifiable ones.

The concept of space and time set forth in this paper can at least claim certain advantages as an hypothesis. It furnishes a solution

⁸ Poincaré has used this illustration in another connection.

to its generating problem,⁹ the need of thinking space and time as infinite, while denying the realization of the infinite number. It has a further advantage over Renouvier's¹⁰ conception in that it exhibits at once the objective reality and the subjective significance of space and time in a simple fashion that accords with common sense. On the other hand, it implies a definite philosophical attitude, and must stand or fall with the success of that attitude in organizing human life in accordance with that need which generates every philosophy; and until set in such an organized system of hypotheses it must remain, even to the author, a matter of belief rather than of knowledge, for knowledge implies the testing of hypotheses not only with respect to the problem from which they spring, but also with reference to their consistency, with the set of solutions of all other problems. Such a development is, however, beyond the bounds of any single paper or any few years' thought.

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DISCUSSION

PHILOSOPHY AND THE HISTORY OF PHILOSOPHY

I DID not hear the two papers to which Professor Creighton refers in his recent discussion in this JOURNAL concerning a philosophical platform, and, from the abstract published, I can not gather much more than that Professor Schmidt and Mrs. Franklin think it is high time for philosophers to come to some sort of working agreement or platform from which further real progress can be made.

Now, it is doubtless true that the discussions in philosophical journals and at philosophical meetings—discussions which would lose their life and meaning if differences, rather than agreements, were not emphasized—do often leave the impression that the debaters are all at odds, and perhaps even that among the protagonists there is no agreement at all either as to methods or as to principles. But debate is the very soul of philosophical progress, and the keenest controversy, like the bitter quarrels of near relatives, often arises amongst those who stand on common ground. In fact, such discussion can be fruitful only if there be a common ground which is presupposed in the very antitheses that may be set up. The impression

⁹ I borrow this term from Dr. Schmidt. Cf. this JOURNAL, Vol. VI., No. 11, 1909, pp. 281-286.

¹⁰ "Il (espace) est l'intuition, qui fait pour ainsi dire prendre corps à l'extériorité fondamentale, à l'extériorité d'une conscience pour une autre conscience, et en est le symbole." *Nouveau Monadologie*, p. 102.